## REMARKS

The Final Office Action mailed August 1, 2007, has been received and carefully reviewed. As of the August 1, 2007 Office Action, Claims 1-34 and 48-53 were pending and presently stand rejected. Applicant herein amends Claims 1, 31-34 and cancels Claim 30.

As of this AMENDMENT B, Claims 1-29, 31-34 and 48-53 are believed to be in condition for allowance and Applicant respectfully requests reconsideration of the application as amended herein.

### Examiner Interview Summary

A telephonic Examiner Interview was conducted, Tuesday, September 25, 2007. Participants in the telephonic Examiner Interview included Examiner Danielle Dunn, Supervisory Patent Examiner Sandra O'Shea, Inventor Rob Gerlach and Counsel Paul C. Oestreich. An informal draft response with argument was used to discuss Claims 1, 6, 9 and 12. No agreement was reached.

### 35 U.S.C. § 103(a) Obviousness Rejections

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

<u>Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. in view of U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al.</u>

The Examiner has rejected Claims 1-2 and 20-23 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al. in view of Turnbull et al. and Amerson et al. Applicant has amended Claim 1 to include all of the limitations of Claim 30 and removed unnecessary limitations, namely, "in addition to or without white (broadband) LEDs" and now recites:

> 1. (Currently Amended) An LED array formed of a plurality of LEDs, each uniquely colored LED or group of identically colored LEDs comprising a dominant wavelength within the visible spectrum (400 to 750 nm), the plurality of LEDs comprising at least five distinct narrowband colors, wherein relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that may be plotted on a CIE Chromaticity diagram within McAdam ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range.

Applicant has amended Claim 1 to recite the limitations of Claim 30, now canceled. Specifically, amended Claim 1 now recites the added limitation "wherein relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that may be plotted on a CIE Chromaticity diagram within McAdam ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range." This is a specific performance limitation that the Examiner acknowledges is not disclosed or suggested in Muthu et al., Turnbull et al. or Amerson et al. [Office Action, p. 11, ¶ 9.ee.]

However, the Examiner asserts that the LEDTRONICS, Inc. references, which illustrate C.I.E. 1931 and 1976 Chromaticity Diagrams "shows relative luminance values for all LEDs operating at full brightness levels plotted on a CIE Chromaticity diagram within McAdams ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature range."

Applicant seeks clarification how the LEDTRONICS, Inc. references teach or suggest

suggest "relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that may be plotted on a CIE Chromaticity diagram within McAdam ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range" as recited in amended Claim 1 and canceled Claim 30. The terms "McAdam ellipses" and "Planckian Locus" do not appear to be disclosed in any of the LEDTRONICS, Inc. references.

Again with regard to Claim 1, the Examiner asserts that Muthu et al. teaches an LED array formed of a plurality of LEDs (FIG. 1, reference numbers 22, 24 and 28). Applicant acknowledges same and notes that the Muthu et al. LEDs are red 22, green 22 and blue 28, only. Col. 2:61-63. More specifically, Muthu et al. teaches "a white luminary LED [that] is made of three types of LED light sources, using a plurality of Red, Green and Blue LEDs." Col. 1:61-63. The invention of Muthu et al. "relates to LED Luminaries and more specifically, to a control system for providing white light with selectable color temperature and dimming level." Col. 1:5-8. Muthu et al. does not disclose or suggest using LEDs with colors other than red, green and blue (RGB), because Muthu et al. further discloses a "light control system [that] is configured to maintain the color temperature and the lumen output level of the emitted white light." Col. 1:63-65. In summary, Muthu et al. teaches away from using "at least five distinct narrowband colors", as recited in Claim 1 because the white light source Muthu et al. is attempting to simulate may be achieved by suitable control of RGB only.

The Examiner further asserts that Turnbull et al. teaches the visible spectrum of light is from 380nm to 780nm. Col. 6:22-25. Applicant acknowledges same. More importantly, in discussing the additive color mixing of RGB displays Turnbull et al. further teaches:

> Energizing all three of the red, green, and blue sub-pixels within a pixel concurrently will yield the perceived color white, if the brightness of each sub-pixel is proportioned properly. The relative proportions of the brightness of each of these differently colored sub-pixels can further be actively manipulated in a wide variety of combinations resulting in a continuum of perceived colors nearly replicating all of the colors available within human color vision, including white. Col. 6:45-53.

Turnbull et al. further teaches:

> LEDs are available in various hues and it is known that the output of red, blue and green LEDs can be combined in a fashion similar to that used for a CRT in the proper proportions to produce a variety of perceived colors, including the perceived color white. For example, in U.S. Pat. No. 5,136,483, Karl-Heinz Schoniger et al. disclose a light emitting device having twelve LEDs arranged to form a headlamp or signaling lamp. Schoniger et al. also disclose that to produce white light, red, green and blue LEDs need to be used simultaneously. However, such as system is rather complicated and Schoniger et al. do not mention the inherent susceptibility of an R-G-B system to unacceptable variation due to significant variations in luminous output produced from one LED to another of the same type. Such LED variations causes errors in the relative proportions of the actual color mixture produced versus that desired and, coupled with high complexity and cost, render the system undesirable for most practical uses. Col. 7:1-18.

The invention of Turnbull et al. is an LED array having only two complementary colors, e.g., "blue-green and amber," that when mixed "form a metameric white illumination." Col. 7:66 to Col. 8:7. The invention of Turnbull et al. attempts to solve the problem of providing "a highly reliable, low-voltage, long-lived, LED illuminator capable of producing white light with sufficient luminous intensity to illuminate subjects of interest." Col. 7:19-24. Turnbull et al. specifically distinguishes its binary-complementary LED approach to white light generation over RGB systems such as Muthu et al. because of the added complexity. Col. 19:55 to Col. 20:20. "In addition, process controls, inventory management, materials handling, and electronic circuit design are further simplified by only having two colors to manipulate rather than three. This substantial simplification decreases manufacturing costs significantly." Col. 22:28-35.

Clearly, Turnbull teaches away from using 5 or more narrowband colored LEDs as recited in Claim 1 because of the increased complexity. Neither Muthu et al. nor Turnbull et al. suggest using more than at most three unique narrowband colors of LEDs for any application.

However, the Examiner further asserts that Amerson et al. teaches an LED array of four distinct colors for the purpose of generating white light. Col. 2:66-67. More specifically, Amerson et al. teaches an array of LEDs containing red, green, blue and amber LEDs. *Id*. The Examiner further asserts that "[a]dding a fifth color to this array will generate a better white light. Likewise, increasing the amount of distinctly colored narrowband colors in the array will generate an even better white light." Office Action ¶ 4.d.

Applicant seeks clarification as to the meaning of "a better white light" and also "an even better white light". The term "better", as used by the Examiner, appears to be subjective. Office Action ¶ 4.d. If the Examiner is suggesting that "better" means "brighter", then Applicant asserts that broader spectral composition or more colors in the color mix has no direct correlation to the brightness of the white light. Applicant asserts that these are two completely independent characteristics of a light source.

Applicant further asserts that the art of record appears to suggest that there are suitable alternative approaches to generating white light. Turnbull et al., Col. 19:55 to Col. 20:20 and Col. 22:28-35; see also, Amerson et al. which specifically describes using a broadband light source, namely, "a halogen bulb, is combined with an array of LED's of a single color." Col. 3:1-3. Amerson et al. also discloses a "broadband light source, for example a halogen bulb, is combined with an array of LED's of two different colors." Col. 3:3-5.

Applicant asserts that even if the Examiner's asserted motivation that adding additional discrete colors to the arrays of LEDs of record were to "generate a better white light", there are specific teachings in the art of record as to why it is not an economically feasible approach. Turnbull et al., Col. 19:55 to Col. 20:20 and Col. 22:28-35. Clearly there are alternative and presumably more economical solutions for generating white light proposed in the art of record. For example, Amerson et al. specifically describes using a broadband light source, namely, "a halogen bulb, is combined with an array of LED's of a single color." Col. 3:1-3. Amerson et al. also discloses a "broadband light source, for example a halogen bulb, is combined with an array of LED's of two different colors." Col. 3:3-5. Turnbull et al. clearly advocates a dual-complementary colored LED approach to

approach to generating white light. And Muthu et al. relies on RGB alone to generate white of light of any desired color temperature.

Simulating white light is a stated motivation behind Applicant's invention, but only one of the stated reasons. Applicant has clearly stated four reasons why an LED array comprising "at least five distinct narrowband colors" is desirable:

> (1) the composition of LED colors used in an array can have a profound impact on apparent color mixing capabilities, (2) average observers perceive major differences between white light made of many discrete colors and that made of only a few, (3) the best color production appears to be from arrays made with the most possible colors of LEDs, and (4) the best white light appears to be that which contains the most wavelengths across the spectrum. Applicant's as-filed application, ¶ [0078].

Thus, Applicant has suggested three other reasons why an LED array using five or more distinct narrowband colors is desirable, none of which appears to be mentioned or suggested by the prior art of record.

Claims 2 and 20-23 depend from amended Claim 1. In view of the amendment to Claim 1, Applicant respectfully requests reconsideration of the Examiner's obviousness rejection of Claims 1-2 and 20-23 based on the asserted combination of Muthu et al. in view of Turnbull et al. and Amerson et al.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. in view of U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. as applied to Claim 1 and further in view of LEDTRONICS, Inc. (100-02a.htm)

The Examiner has rejected Claims 3-5 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al. and Turnbull et al. in view of LEDTRONICS, Inc. (100-02a.htm). The Examiner acknowledges that neither Muthu et al. nor Turnbull et al. teaches LEDs producing colored light with a spectral half-width of less than about 60 nm, 40 nm, or 30 nm. The Examiner asserts that LEDTRONICS, Inc. (100-02a.htm) teaches LEDs having spectral half-widths ranging from 90 nm to 20 nm, which in combination with Muthu et al. and Turnbull et al. renders Claims 3-5 obvious.

Claims 3-5 depend from amended Claim 1. Applicant asserts that none of the references of record appear to teach or suggest the limitations of amended Claim 1:

> 1. (Currently Amended) An LED array formed of a plurality of LEDs, each uniquely colored LED or group of identically colored LEDs comprising a dominant wavelength within the visible spectrum (400 to 750 nm), the plurality of LEDs comprising at least five distinct narrowband colors, wherein relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that may be plotted on a CIE Chromaticity diagram within McAdam ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range.

The Examiner asserts that "it would have been obvious at the time the invention was made to use the array of LEDs of Muthu et al. within the visible spectrum as noted by Turnbull et al. in combination with the LEDs from LEDTRONICS, Inc. to illuminate an object because this would allow for greater illumination of objects." Office Action, ¶ 5.k. Applicant seeks clarification why the recited spectral half-widths recited in Claims 3-5 "would allow for greater illumination of objects".

For all of these reasons, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 3-5.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. in view of U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. as applied to Claim 1 and further in view of LEDTRONICS, Inc. (38.htm)

The Examiner has rejected Claims 6-7, 9-10, 12-13 and 15-19 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al. and Turnbull et al. and further in view of LEDTRONICS, Inc. (38.htm). The Examiner acknowledges that neither Muthu et al. nor Turnbull et al. nor Amerson et al. teaches the limitations recited in Claims 6-7, 9-10, 12-13 and 15-19. The Examiner asserts that LEDTRONICS, Inc. (38.htm) teaches or suggests

suggests the additional limitations, which in combination with Muthu et al. and Turnbull et al. renders Claims 6-7, 9-10, 12-13 and 15-19 obvious.

Claims 6-7, 9-10, 12-13 and 15-19 depend from amended Claim 1. Applicant asserts that none of the references of record appear to teach or suggest the limitations of amended Claim 1:

> 1. (Currently Amended) An LED array formed of a plurality of LEDs, each uniquely colored LED or group of identically colored LEDs comprising a dominant wavelength within the visible spectrum (400 to 750 nm), the plurality of LEDs comprising at least five distinct narrowband colors, wherein relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that may be plotted on a CIE Chromaticity diagram within McAdam ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range.

Regarding Claim 18, the Examiner asserts that LEDTRONICS, Inc. (38.htm) "teaches the dominant wavelengths gradually increasing away from either side of approximately 555nm." Office Action, ¶ 6.s. Applicant's analysis of LEDTRONICS, Inc. (38.htm) can find no evidence of such teaching. Applicant respectfully requests clarification regarding where such teaching may be found in LEDTRONICS, Inc. (38.htm).

Regarding Claim 19, the Examiner further asserts that LEDTRONICS, Inc. (38.htm) "teaches LEDs with a dominant wavelength in the near ultra-violet region." Again, Applicant's analysis of LEDTRONICS, Inc. (38.htm) can find no evidence of such teaching. Applicant respectfully requests clarification regarding where such teaching may be found in LEDTRONICS, Inc. (38.htm).

For these reasons, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 6-7, 9-10, 12-13 and 15-19.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. and U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. and LEDTRONICS, Inc. (38.htm) as applied to Claim 1 and further in view of The LED Museum (ledleft.htm)

The Examiner has rejected Claims 8, 11 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al. and Turnbull et al. and Amerson et al. and LEDTRONICS, Inc. (38.htm) and further in view of The LED Museum (ledleft.htm). The Examiner acknowledges that neither Muthu et al. nor Turnbull et al. and LEDTRONICS, Inc. (38.htm) teach the limitations recited in Claims 8, 11 and 14. The Examiner asserts that The LED Museum (ledleft.htm) teaches or suggests the additional limitations, which in combination with Muthu et al. and Turnbull et al. and Amerson et al. and LEDTRONICS, Inc. (38.htm) renders Claims 8, 11 and 14 obvious.

Claims 8, 11 and 14 depend from amended Claim 1. Applicant's review of the Examiner's asserted combination of Muthu et al. and Turnbull et al. and Amerson et al. and LEDTRONICS, Inc. (38.htm) and further in view of The LED Museum (ledleft.htm) does not appear to teach or suggest all of the limitations of amended Claim 1. More specifically, it is not apparent to the Applicant that the references teach or suggest "relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that may be plotted on a CIE Chromaticity diagram within McAdam ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range" as recited in amended Claim 1 and canceled Claim 30. For this reason, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 8, 11 and 14.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. and U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. as applied to Claim 1

The Examiner has rejected Claims 24-26 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al., Turnbull et al. and Amerson et al. The Examiner acknowledges that neither Muthu et al. nor Turnbull et al. nor Amerson et al. teaches the

amount of power that each of the plurality of LEDs comprise. The Examiner asserts that it would have been obvious to one skilled in the art at the time the invention was made to perform testing to acquire the optimal wattage values to avoid overheating, thus rendering Claims 24-26 obvious.

Claims 24-26 depend from amended Claim 1. Applicant asserts that none of the references of record appears to teach or suggest "relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that may be plotted on a CIE Chromaticity diagram within McAdam ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range" as recited in amended Claim 1 and canceled Claim 30. For this reason, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 24-26.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. in view of U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. as applied to Claim 1 and further in view of LEDTRONICS, Inc. (097b.htm)

The Examiner has rejected Claims 30-34 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al., Turnbull et al. and Amerson et al. and further in view of LEDTRONICS, Inc. (097b.htm). The Examiner acknowledges that neither Muthu et al. nor Turnbull et al. teaches the "relative luminance values for all LEDs within the LED array operating at full brightness levels, resulting in a composite white-type light that may be plotted on a CIE Chromaticity diagram within McAdam ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature range", as recited in now canceled Claim 30. Applicant has canceled Claim 30 and amended Claim 1 to include all of the limitations of Claim 30. Applicant has also amended Claims 31-34 to change dependency from Claim 30 (canceled) to amended Claim 1.

The Examiner asserts that LEDTRONICS, Inc. (097b.htm) teaches or suggests the CIE Chromaticity diagrams from 1931 and 1976 which show the relative luminance values of all LEDs operating at full brightness levels plotted on a CIE Chromaticity diagram and various temperature ranges as recited in Claims 30-34, which in combination with

combination with Muthu et al. and Turnbull et al. renders Claims 30-34 obvious. As noted above, Applicant's review of the LEDTRONICS, Inc. references fails to show that they teach or suggest "relative luminance values for all LEDs within the LED array operating at full brightness levels results in a composite white-type light that may be plotted on a CIE Chromaticity diagram within McAdam ellipses that are on or adjacent to a Planckian Locus within a predefined correlated color temperature (CCT) range" as recited in amended Claim 1 and canceled Claim 30. The terms "McAdam ellipses" and "Planckian Locus" do not appear to be disclosed on any of the LEDTRONICS, Inc. references.

Amended Claims 31-34 depend from amended Claim 1. For these reasons, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 31-34.

Obviousness Rejection Based on U.S. Patent No. 6,441,558 to Muthu et al. in view of U.S. Patent No. 5,803,579 to Turnbull et al. and U.S. Patent No. 6,379,022 to Amerson et al. as applied to Claim 1 and further in view of Pearson Product Moment Correlation Coefficient

The Examiner has rejected Claims 48-53 under 35 U.S.C. § 103(a) as being unpatentable over Muthu et al., Turnbull et al. and Amerson et al. and further in view of Pearson Product Moment Correlation Coefficient. More specifically, the Examiner asserts the Muthu et al., Turnbull et al. and Amerson et al. teach all the limitations of Claims 48-53 except for using a specific correlation coefficient.

Claims 48-53 depend from amended Claim 1. Thus, Claims 48-53 are believed to be allowable for the same reasons as amended Claim 1.

Furthermore, the Examiner has cited no motivation or suggestion that it would be obvious to have a correlation coefficient between an LED array and midday sunlight. For these reasons, Applicant respectfully requests reconsideration of the obviousness rejection of Claims 48-53.

Claims 27-29

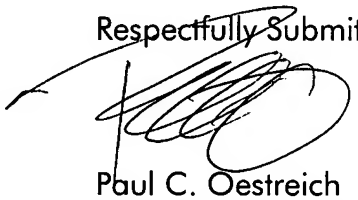
Applicant notes that Claims 27-29 were rejected in the Office Action Summary. However, the Examiner has not provided any explanation regarding the rejection of Claims 27-29. Applicant asserts the dependence of Claims 27-29 on amended Claim 1 for the allowability of Claims 27-29. Applicant respectfully seeks clarification from the Examiner regarding the specific reasons for the rejection of Claims 27-29.

## CONCLUSION

Claims 1-29, 31-34 and 48-53 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, the Examiner is respectfully invited to contact Applicants' undersigned attorney.

The Commissioner is hereby authorized to charge any additional fee or to credit any overpayment in connection with this Amendment to Deposit Account No. 50-0881.

Respectfully Submitted,



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